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The effect of protein and lipid source in organic feed for (organic) rainbow trout on sensory quality

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INTRODUCTION

Traditionally, feed used for aquaculture production of rainbow trout (*Oncorhynchus mykiss*) is similar to feed used for most other carnivorous fish species and have mainly been based on fishmeal and fish oil. However, these resources are limited and due to the globally increasing aquaculture production the exploration of alternative ingredients for fish feed is needed (Barlow, 2001; Watanabe, 2002). Similarly there is an increasing interest in organic production of aquaculture fish product.

AIM

Study the consequence of partly replacing fish meal and replacing fish oil in the feed for rainbow trout with organic vegetable protein and oil on the sensory characteristics of the rainbow trout.

Samples

- Organic rainbow trout (*Oncorhynchus mykiss*) was used in the experiment.
- The experiment included six different organic feeds (Figure 1).
- After the feeding experiment the fish were kept for 15 days on tap water before slaughtering.
- After slaughtering the fish were degutted and packed in ice for 24 hours and then vacuum packed and frozen (-40°C for 10 days).
- Then the fish were thawed at 2°C for six hours followed by a ice storage period (3, 5, 7 and 14). Then sensory profiling was performed.

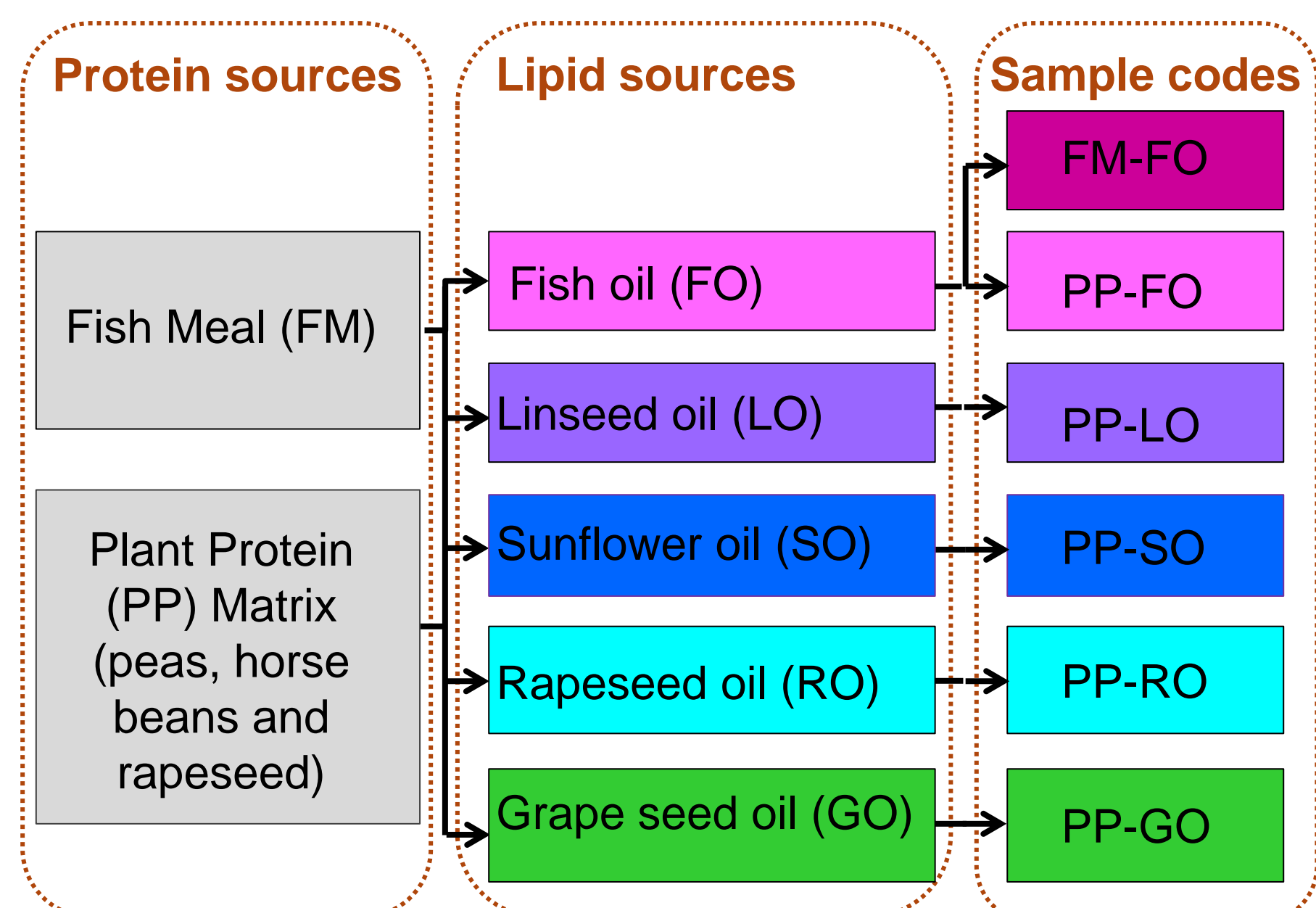


Figure 1: Overview of the six different feed used in the experiment. The feeds with vegetable oil do not contain any fish oil. However fish meal was only partly 40% replaced with plant protein (PP) in the samples with PP. Fish were feed the feed for 57 days. The fish had an initial mean weight of 79 ± 12 g and in the end of the experiment the mean weight of 205 ± 39 g.

Sensory profiling

- The samples were placed with the skin facing downwards in a porcelain tray and were heat-treated in a convection oven at 100°C until a core temperature of 70°C was reached. Then the samples were served to the sensory assessors.
- Each porcelain tray was marked with a three-digit code on the lid and all samples were served in random order and in replicates to the panel.
- The sensory panel consisted of 11 assessors. A minimum of 7 assessors were present each test day.
- All assessors were selected, tested, and trained in descriptive analysis of rainbow trout according to standards (ISO 11035; ISO 8586-1; NMKL 21).
- The sensory descriptors are presented in Table 1.
- The evaluations were performed according to ISO 8589.

Table 1: Sensory descriptors used in the sensory profiling. The descriptors were evaluated on a 15 cm unstructured scale anchored 1.5 cm from each end.

Descriptor	Minimum (0 cm)	Maximum (15 cm)	Descriptor	Minimum (0 cm)	Maximum (15 cm)
Odour (O)			Texture (T)		
Earthy	None	Strong	Flaky	None	Strong
Mushroom	None	Strong	Firm	Soft	Firm
Boiled potatoes	None	Strong	Juicy	Dry	Juicy
Sourish	None	Strong	Stringy	None	Strong
Warm milk	None	Strong	Oily	None	Strong
Fishy	None	Strong	Flavour (F)		
Rancid	None	Strong	Sweet	None	Strong
Sour	None	Strong	Fresh fish oil	None	Strong
Off-flavour	None	Strong	Green	None	Strong
Appearance (A)			Chicken	None	Strong
Colour	None	Strong	Rancid	None	Strong
Discoloured	Light	Dark	Sour	None	Strong
Fluid extraction	None	Strong	Fishy	None	Strong
			Off-flavour	None	Strong

References

The results presented on the poster is accepted for publication in "Journal of Aquatic Food Product Technology"

Barlow, S. (2001). The Advocate 4: 85-88.

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ISO standards 11035 (1994), 8586-1 (1993) & 8589 (1988). Geneva, Switzerland.

NMKL Procedure 21. (2008) Hyldig, G., Carlehög, M., Martinsdóttir, E., Sveinsdóttir, K. & Lilleberg, L.

RESULTATS

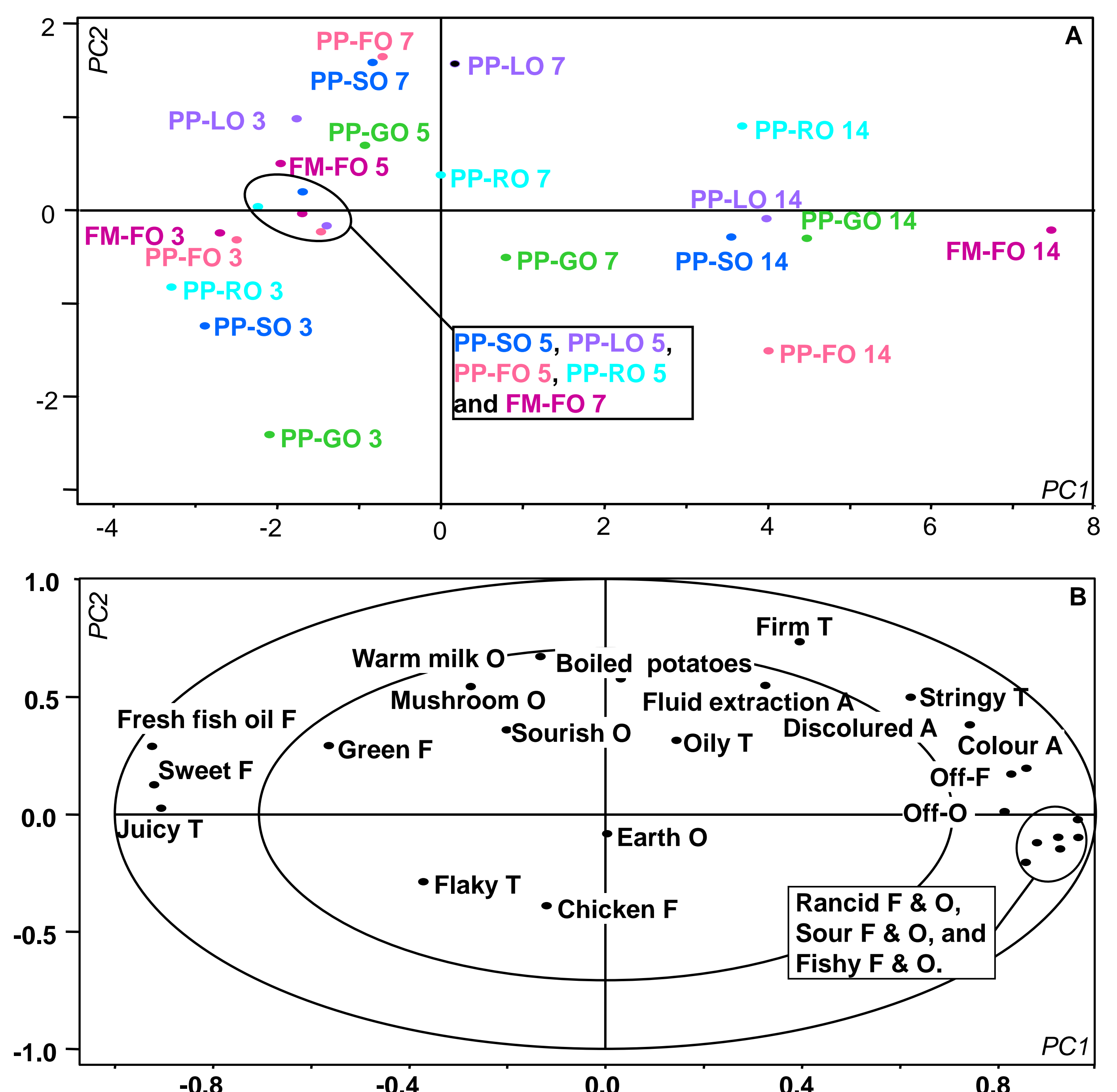


Figure 2: Scores (A) and correlation loadings (B) from PC1 and PC2 (70 and 8% of the variation respectively) from a Principal Component Analysis (PCA) model. Samples are shown by using sample codes (Figure 1) combined with duration of storage in ice (3, 5, 7 and 14 days). Sensory descriptors are described in table 1.

Storage time in ice (figure 2):

- The results showed as expected a clear effect of the storage time.
- Long storage time was correlated to e.g. off-flavour, sour, rancid, fish odour and discoloured.
- Short storage time was correlated to juicy and flaky texture, fresh fish oil and sweet flavour.

Difference between feeds (figure 2):

- After 3 days of storage some differences between feeds could be observed. Especially fish fed grape seed oil (PP-GO-3) had a notable sensory profile with high intensity of chicken flavour and flaky texture.
- After 5 days of storage in ice the fish showed more similarity in the sensory profile.
- After 7 days in ice some differences in sensory profile was observed. The trout which had rapeseed oil and grape seed oil (PP-RO 7 and PP-GO 7) generally had a more neutral flavour and odour profile with a lower intensity of mushroom odour, boiled potatoes odour, fresh fish oil and sweet flavour. Furthermore the texture was less flaky, firm, juicy, stringy and oily compared to the other samples.
- After 14 days of ice storage the trout that had fishmeal and fish oil in the feed had a different sensory profile than the other trout in the experiment. The trout fed fishmeal and fish oil (FM-FO-14) had a high intensity of several negative flavour and odour descriptors including rancid flavour and odour. The results showed that the use of plant protein in the feed can prolong the shelf-life of trout stored in ice.

Conclusion

Overall the results showed that the sensory characteristics of the trout were affected in different ways during ice storage. The source of lipid seemed to affect the sensory quality at the beginning of the storage period, while the protein source seemed to have a more pronounced impact at the end of the storage period.

ACKNOWLEDGMENTS

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